Microfabricated G-Band Antenna Arrays, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

This proposal addresses the need for an antenna technology platform that meets the requirements of high-performance materials, exacting dimensional tolerances, and the geometrical design freedom to enable planar antenna array technologies for frequencies greater than 100GHz. The PolyStrata fabrication technology, being developed at Nuvotronics, LCC, Blacksburg, VA., is capable of meeting or exceeding all of the requirements outlined to be a solution for these frequencies. Air-filled copper rectangular coaxial transmission lines are fabricated using a photolithographically defined layer-by-layer process. The resulting transmission lines are extremely broadband, low-dispersion, high-isolation, and low loss compared to other forms of planar transmission lines. These lines are smaller than rectangular waveguides because the transverse cross-sections of the lines are not resonant. Phase I of this work includes designing a frequency-scanned antenna-array operating from 140-160GHz that would provide ±16

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beam steering with a beamwidth of 0.5

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and 400MHz per beam bandwidth. An antenna array with this performance would require roughly a 24cm by 24cm aperture to fabricate. This is possible using 4 sub-arrays that each are fabricated on a single wafer and then tied together to achieve the overall system performance. The approach will offer a high-yield, cost effective product that will meet the NASA needs.

Anticipated Benefits

Potential NASA Commercial Applications: Other agencies (Air Force, Navy) could use the GLARA's autonomous landing advantages as well as its small payload in autonomous landing and harbor guidance. The FSA would provide a substantially smaller payload for aircraft and heightened resolution in topography and velocity measurements. The GLARA realized by the batch-level PolyStrata process can reduce costthereby making the autonomous landing radar a viable solution on many aircraft increasing long-term safety of craft and personnel. Harbor guidance for ships deals with the same weather and atmospheric-related issues. Additional applications include weather warnings and atmospheric research, especially where radar is mounted on aircraft or other vehicles to conduct surveys. The cost advantages would aid in the proliferation of radar at these frequencies. Since many of the current generation radars used for weather warning systems and meteorological forecasts are being updated with newer technologies [Heinselman, 2008], the GLARA innovations could offer cost and size advantages.

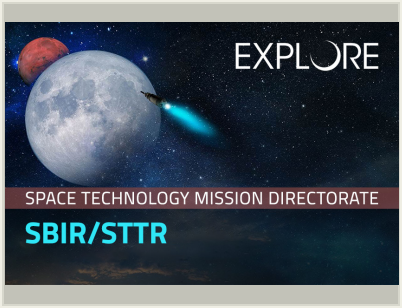

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Table of Contents

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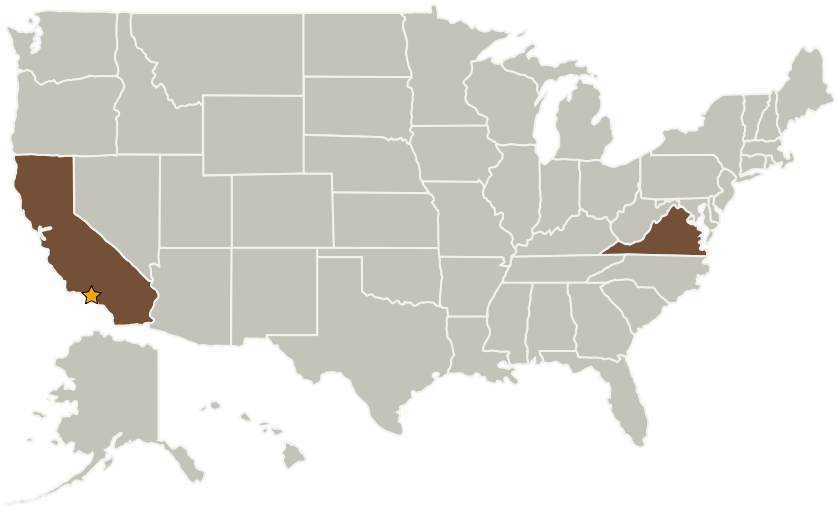
Completed Technology Project (2009 - 2009)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Nuvotronics, Inc	Supporting Organization	Industry	Radford, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

January 2009: Project Start

July 2009: Closed out

Closeout Summary: Microfabricated G-Band Antenna Arrays, Phase I Project I mage

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

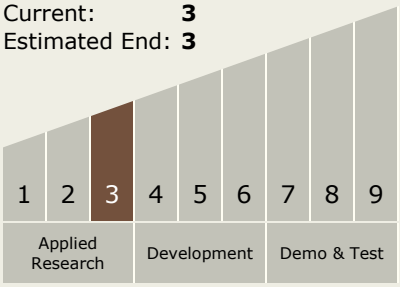
Carlos Torrez

Principal Investigator:

Kenneth J Vanhille

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves